

Voxel modelling of sands and gravels of Pleistocene Rhine and Meuse deposits in Flanders (Belgium)

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Voxel modelling or 3D volume modelling of Quaternary raw materials is VITO's next step in the geological layer modelling of the Flanders and Brussels Capital Region in Belgium (G3D - Matthijs et al., 2013). The aim is to schematise deposits as voxels ('volumetric pixels') that represent lithological information on a grid in three-dimensional space (25 x 25 x 0.5 m).

A new voxel model on Pleistocene Meuse and Rhine sands and gravels will be illustrated succeeding a voxel model on loess resources (van Haren et al., 2016). The model methodology is based on a geological 'skeleton' extracted from the regional geological layer model of Flanders. This framework holds the 3D interpolated lithological information of 5.000 boreholes.

First a check on quality and spatial location filtered out significant and usable lithological information. Subsequently a manual geological interpretation was performed to analyse stratigraphical arrangement and identify the raw materials of interest. Finally, a workflow was developed that automatically encodes and classifies the borehole descriptions in a standardized manner. This workflow was implemented by combining Microsoft Access[®] and ArcMap[®] and is able to convert borehole descriptions into specific geological parameters.

An analysis of the converted lithological data prior to interpolation improves the understanding of the spatial distribution, to fine tune the modelling process and to know the limitations of the data.

The converted lithological data were 3D interpolated in Voxler using IDW and resulted in a model containing 52 million voxels. It gives an overview on the regional distribution and thickness variation of interesting Pleistocene aggregates of Meuse and Rhine.

Much effort has been put in setting up a database structure in Microsoft Access[®] and Microsoft SQL Server[®] in order to arrange and analyse the lithological information, link the voxel model with the geological layer model and handle and analyse the resulting voxelmodel data.

The database structure allows to analyse and set certain preconditions (minimal thickness or maximum depth of aggregates, maximum thickness of intercalating clays) on the model in order to calculate and view distributions of deposits which meet these preconditions. These results are interesting for pre-prospective purposes, illustrating the distribution of lithological information and making the end user more aware of the potential economic value of the subsurface.

References

van Haren T. et al (2016) - An interactive voxel model for mineral resources: loess deposits in Flanders (Belgium). *Zeitschrift der Deutschen Gesellschaft für Geowissenschaften*, Volume 167, Number 4, pp. 363-376(14).

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